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I. Solution by **C. E. ARMENTROUT**, Professor of Mathematics, Rockingham Military Institute, Mt. Crawford, Va.; **G. B. M. ZERR**, A. M., Ph. D., The Temple College, Philadelphia, Pa.; and **P. S. BERG**, Larimore, N. D.

Let $(y/x)^2$ be the square proper fraction.

$1-(y/x)^2=(n/m)^2$ or $m^2(x^2-y^2)=n^2x^2$.

Let $x=p^2+q^2$, $y=p^2-q^2$.

$\therefore 1-\left(\dfrac{p^2-q^2}{p^2+q^2}\right)=\dfrac{4p^2q^2}{(p^2+q^2)^2}$, where p can be any value greater than q.

Let $p=2$, $q=1$. $\therefore 1-(\frac{3}{5})^2=(\frac{4}{5})^2$.

Let $p=3$, $q=2$. $\therefore 1-(\frac{5}{13})^2=(\frac{12}{13})^2$.

II. Solution by **M. A. GRUBER**, A. M., War Department, Washington, D. C., and **COOPER D. SCHMITT**, A. M., University of Tennessee, Knoxville, Tenn.

This reduces to the simple statement that $a^2/c^2+b^2/c^2=1$, or that $a^2+b^2=c^2$. This is evidently satisfied in the case of every rational right triangle.

Thus, $3^2+4^2=5^2$, or $\frac{9}{25}+\frac{16}{25}=1$.

This is the same as saying $1-\frac{9}{25}=\frac{16}{25}$, thus fulfilling the condition of the problem.

Similarly an indefinite number of examples might be given.

Also solved by *J. H. DRUMMOND*, *ALOIS F. KOVARIK*, *J. W. YOUNG*, and the late *SYLVESTER ROBINS*.

86. Proposed by **A. H. BELL**, Hillsboro, Ill.

The edges of a rectangular parallelopiped are within one of the proportion 3:6:7, and if they are $3x$, $6x\mp1$, $7x$, then $(3x)^2+(6x\mp1)^2+(7x)^2=$the diagonal squared$=94x^2\mp12x+1=\square$. To find four integral values for x in this equation.

Solution by **G. B. M. ZERR**, A. M., Ph. D., Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.

Let $94x^2\mp12x+1=(mx\mp1)^2=m^2x^2\mp2mx+1$.

$\therefore x=\pm\dfrac{2(m-6)}{94-m^2}$.

Expanding $\sqrt{94}$ as a continued fraction we get

$$\sqrt{94}=9+\frac{1}{1+}\,\frac{1}{2+}\,\frac{1}{3+}\,\frac{1}{1+}\,\frac{1}{1+}\,\frac{1}{5+}\,\frac{1}{1+}\,\frac{1}{8+}\,\frac{1}{1+}\,\frac{1}{5+}\,\frac{1}{1+}\,\frac{1}{1+}\,\frac{1}{3+}\,\frac{1}{2+}\,\frac{1}{1+}\,\frac{1}{9+}$$

The successive convergents are as follows :

$$\frac{9}{1},\quad \frac{10}{1},\quad \frac{29}{3},\quad \frac{97}{10},\quad \frac{126}{13},\quad \frac{223}{23},\quad \frac{1241}{128},\quad \frac{1644}{151},\quad \frac{12953}{1336},\quad \frac{14417}{1487},$$

$$\frac{85038}{8771},\quad \frac{99455}{10258},\quad \frac{184493}{19029},\quad \frac{652934}{67345},\quad \frac{1490361}{1537191},\quad \frac{2143295}{221064},\quad \cdots\ \cdot\cdot$$

The first integral value of x is given by substituting for m the eighth convergent, the second by using the sixteenth convergent for m.

Let $m=\frac{1464}{151}$, $x=84258$, $3x=252774$, $6x-1=505547$, $7x=589806$, $94x^2-12x+1=(816911)^2$.

Let $m=-\frac{1464}{151}$, $x=357870$, $3x=1073610$, $6x+1=2147221$, $7x=2505090$, $94x^2+12x+1=(3469679)^2$.

Let $m=\frac{2143295}{221064}$, then $x=361179226608$, $3x=1083537679824$, $6x-1=2167075359647$, $7x=2528254586256$, $94x^2-12x+1=(3501762523489)^2$.

Let $m=-\frac{2143295}{221064}$, then $x=1534042236912$, $3x=4602126710736$, $6x+1=9204253421471$, $7x=10738295658384$, $94x^2+12x+1=(14873091304609)^2$.

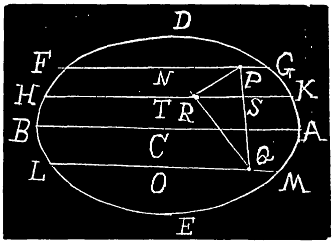
AVERAGE AND PROBABILITY.

95. Proposed by G. B. M. ZERR. A. M., Ph. D., Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.

Three random points are taken in an ellipse, one on each side of the major axis, and the third anywhere in the ellipse. Find the average area of the triangle formed by joining the three points.

Solution by the PROPOSER.

Let $ADBE$ be the ellipse, AB the major and DE the minor axis, C the center, and PQR the triangle formed by joining the random points. Through P, Q, R draw the chords FG, LM, HK parallel to AB.



It is only necessary to consider the relative positions in which the chord HK lies between the chords FG and LM.

Let $CD=CE=b$, $CA=CB=a$, $CN=u$, $CO=v$, $CT=w$, $NP=x$, $OQ=y$, $TR=z$, $TS=t$, $NG=x'$, $OM=y'$, $TK=z'$.

Then $x'=(a/b)\sqrt{(b^2-u^2)}$, $y'=(a/b)\sqrt{(b^2-v^2)}$, $z'=(a/b)\sqrt{(b^2-w^2)}$, $t=y-\dfrac{(y-x)\,(w-v)}{u-v}$.

Area $PQR=\frac{1}{2}(t-z)(u-v)=A$, $t>z$. Area $PQR=\frac{1}{2}(z-t)(u-v)=A_1$, $t<z$.

The limits of u are 0 and b; of v, $-b$ and 0; of w, v and u; of x, $-x'$ and x'; of y, $-y'$ and y'; of z, $-z'$ and t, and t and z'.

Hence, since the whole number of ways the three points can be taken is $\frac{1}{4}\pi^3a^3b^3$ and doubling since P and Q are interchangeable the required average area is

$$\triangle=\frac{8}{\pi^3a^3b^3}\int_{0.}^{b}\int_{-x'}^{x'}\int_{-b}^{0}\int_{-y'}^{y'}\int_{v}^{u}\left[\int_{-z'}^{t}Adz+\int_{t}^{z}A_1dz\right]dudxdvdydw$$